PATENT ABSTRACTS OF JAPAN

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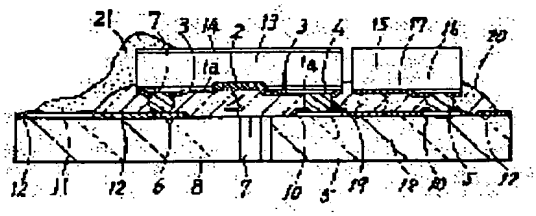
(54) OPTICAL DEVICE AND ITS MANUFACTURE

(57)Abstract:
PURPOSE: To prevent residual flux in a light transmission path from mixing into transparent resin of an optical device.
CONSTITUTION: A solder bump 5 with flux 19 applied on an end of a light emitting element array chip 13 is formed, while an anti-tilting stud 6 without flux applied is provided at the opposite end, and transparent resin 20 for protecting the light emitting element array chip 13 and the solder bump 5 is injected from a side of the anti-tilting stud 6.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is what is made to pass a substrate and irradiates the exposure light from a light emitting device array chip to the exterior. ******, On the substrate of translucency, said light emitting device array chip has an opening, and surface mounting is carried out. In the optical equipment to which the solder bump for connection intervened between the electrode of said light emitting device array chip in an opening, and the conductor pattern on a substrate, and the closure of said opening was carried out by transparence resin said electrode Optical equipment which is arranged only at the end section of said light emitting device array chip, and is characterized by preparing the projection for inclination prevention in the other end of this light emitting device array chip.
[Claim 2] Form an electrode in the end section of a light emitting device array chip, and a solder bump is projected and formed in this electrode. Project and form the projection for inclination prevention in the other end of a light emitting device array chip, and flux is applied to said solder bump. The manufacture approach of the optical equipment which this solder bump is contacted to the conductor pattern on a substrate, and makes temporary connection, carries out a solder reflow, having a substrate between a light emitting device array chip and a substrate, and is characterized by carrying out surface mounting, pouring in transparence resin from the projection side of an opening, and carrying out the resin seal of the opening.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the optical equipment which comes to carry out surface mounting of the light emitting device array chip which has a light-emitting part and a solder bump on a semi-conductor substrate, and its manufacture approach.
[0002]
[Description of the Prior Art] The sectional view of the optical equipment of the former [drawing 7], the front view of a light emitting device array, and the sectional view and the sectional view in which drawing 11 is the same and showing the condition in front of the reflow of optical equipment where drawing 10 is the same where drawing 8 is the same and where drawing 9 is the same, and drawing 12 are the sectional views showing the condition after the reflow and washing similarly. [the top view,]
[0003] In drawing 9 and 10, 13 is a light emitting device array chip (LED array chip), and 1 is semi-conductor substrates, such as gallium arsenide (GaAs), it forms insulation [a selective diffusion mask-cum-] coat 1a which consists of silicon nitride etc., establishes the punch station for diffusion in a center section, forms pn junction in the punch station by the diffusion approach etc., and constitutes the light-emitting part 2. 4 consisted of aluminum etc. with the electrode for electric supply, and is arranged by turns in the direction which intersects perpendicularly in the array direction of a light-emitting part 2, and the insulating coat 3 which consists of silicon nitride etc. on it is put. There is a punch station in this insulating coat 3, and the solder bump 5 by the barrier layer (not shown), plating, etc. is formed one by one on it.
[0004] Next, a print head is mentioned as an example and the optical equipment of 300DPI which mounted the light emitting device array chip 13 is explained.
[0005] Like drawing 7 -8, the fiber bundle 9 which a substrate 8 consists of an ingredient which has the translucency of glass etc., and consists of many optical fibers is laid underground, a conductor pattern 10 and the common electrode patterns 11, such as aluminum and copper, are formed in the front face of a thin film process, and the insulating coat 12 which consists of silicon nitride etc. is formed except the connection.
[0006] On this conductor pattern 10, the IC chip 15 which controls the light emitting device array chip 13 and this light emitting device array chip 13 is being connected by the solder bump 5, respectively, and it works as one terminal for making light emit. In addition, the light-emitting part 2 of the light emitting device array chip 13 s a fiber bundle 9 and intermediary **** [as] which counters.
[0007] Like drawing 11 , this solder bump's 5 connection method applies flux 18 with a replica method etc. in a onder on a conductor pattern 10, and carries the light emitting device array chip 13 and the IC chip 15 on it. Temporary adhesion of the light emitting device array chip 13 and the IC chip 15 is carried out by flux 18, they are in this condition, and the solder bump 5 fuses them by letting a reflow process pass like drawing 12 , and they are connected with a conductor pattern 10.
[0008] Next, flux 18 is washed in an acetone, IPA, etc.
[0009] Between a substrate 8, the light emitting device array chip 13, and the IC chip 15, while the transparence resin 20 which consists of ingredients, such as an epoxy resin, is filled up with the dispenser etc. and takes care of the light emitting device array chip 13, the IC chip 15, and the solder bump 5, it serves to penetrate the light emitted from the light-emitting part 2 of the light emitting device array chip 13, and to irradiate on a photo conductor through a fiber bundle 9.
[0010] By applying conductive resin 21, such as an epoxy resin which mixed silver powder, by the dispenser, nask printing, etc., it connects with the common electrode pattern 11, and the common signal electrode 14 on he rear face of a light emitting device array chip works as a common electrode side edge child for making light emit.
[0011] In the case of 300DPI, the light emitting device array chip 13 is arranged on [40] a straight line, and the

light-emitting part 2 of the light emitting device array chip 13 is constituted on a total of 2560-piece straight line.

[0012]

[Problem(s) to be Solved by the Invention] However, the problem which becomes the hindrance of transparency of the light which the flow of a penetrant remover was bad like drawing 12 since the solder bump 5 was in both sides after face down (F/D) bonding in a reflow and the process to wash, the flux residue 19 remained in the central light-emitting part 2, and emitted the light emitting device array chip 13 from the light-emitting part 2 by the conventional approach is ******.

[0013] Moreover, the problem which the flux residue 19 adhering to the solder bump's 5 perimeter mixes in transparence resin 20 in case transparence resin 20 is poured in, and becomes the hindrance of transparency of light similarly is ******.

[0014] This invention aims at offer of the optical equipment which can prevent the flux residue in the light transmission way after transparence resin impregnation and in transparence resin, and its manufacture approach in view of the above-mentioned technical problem.

[0015]

[Means for Solving the Problem] The technical-problem solution means by this invention claim 1 is what is made to pass a substrate 8 and irradiates the exposure light from the light emitting device array chip 13 to the exterior like drawing 1 -6. ******, On the substrate 8 of translucency, said light emitting device array chip 13 has Opening X, and surface mounting is carried out. In the optical equipment to which the solder bump 5 for connection intervened between the electrode 4 of said light emitting device array chip 13 in Opening X, and the conductor pattern 10 on a substrate 8, and the closure of said opening X was carried out by transparence resin 20 Said electrode 4 is arranged only at the end section of said light emitting device array chip 13, and the projection 6 for inclination prevention is formed in the other end of this light emitting device array chip 13.

[0016] The technical-problem solution means by this invention claim 2 forms an electrode 4 in the end section of the light emitting device array chip 13. Project and form the solder bump 5 in this electrode 4, and the projection 6 for inclination prevention is projected and formed in the other end of the light emitting device array chip 13. Apply flux 18 to said solder bump 5, contact this solder bump 5 to the conductor pattern 10 on a substrate 8, and temporary connection is made. A solder reflow is carried out having a substrate 8 between the light emitting device array chip 13 and a substrate 8, surface mounting is carried out, transparence resin 20 is poured in from the projection 6 side of Opening X, and the resin seal of the opening X is carried out.

[0017]

[Function] In the above-mentioned technical-problem solution means, flux 18 is applied to the solder bump 5, the solder bump 5 is contacted to the conductor pattern 10 on a substrate 8, and temporary connection is made. Under the present circumstances, it sets without applying flux to projection 6. Next, having a substrate 8 between the light emitting device array chip 13 and a substrate 8, a solder reflow is carried out and surface mounting is carried out. And transparence resin 20 is poured in from the projection 6 side of Opening X, and the resin seal of the opening X is carried out.

[0018] Since flux is not applied around the projection 6 used as an inlet at this time, mixing of the residue of flux can be prevented at the time of impregnation of transparence resin 20.

[0019]

[Example] The top view, the front view of a light emitting device array chip, and the sectional view and the sectional view in which drawing 5 is the same and showing the condition in front of the reflow of optical equipment where drawing 4 is the same where drawing 2 is the same and where drawing 3 is the same, and drawing 6 R> 6 are the sectional views showing the condition after the reflow and washing similarly. [the sectional view in which drawing 1 shows the optical equipment of the first example of this invention,]

[0020] Like drawing 1 -6, the optical equipment of this example is used for an LED printer etc. By the LED print head which is made to pass a substrate 8 and irradiates the exposure light from the light emitting device array chip 13 to the exterior, ******, On the substrate 8 of translucency, the light emitting device array chip 13 has Opening X, surface mounting is carried out, the solder bump 5 for connection intervenes between the electrode 4 of said light emitting device array chip 13 in Opening X, and the conductor pattern 10 on a substrate 8, and the closure of said opening X is carried out by transparence resin 20.

[0021] First, said light emitting device array chip 13 is explained. In drawing 3 and 4, 1 is semi-conductor substrates, such as gallium arsenide (GaAs), it forms insulation [a selective diffusion mask-cum-] coat 1a which consists of silicon nitride etc., establishes the punch station for diffusion in a center section, forms pn junction in the punch station by the diffusion approach etc., and constitutes the light-emitting part 2. 4 consisted of aluminum etc. with the electrode for electric supply, and is arranged by turns in the direction which intersects perpendicularly in the array direction of a light-emitting part 2, and the insulating coat 3 which consists of silicon

nitride etc. on it is put. A punch station is formed in the end section of this insulating coat 3, and the solder bump 5 by the barrier layer, plating, etc. is formed one by one on it. In addition, it omits about a barrier layer.
[0022] Moreover, the pad 7 which consists of ingredients, such as nickel and titanium, is formed in the other end of this light emitting device array chip 13, i.e., the solder bump's 5 opposite side, and the insulating coat 3 is put. A punch station is established in this insulating coat 3, and the projection 6 (stud) for inclination prevention which consists of ingredients, such as 2-10 copper, is formed with plating etc. on it.
[0023] Next, drawing 1 and 2 explain the print head of 300DPI which mounted said light emitting device array chip 13.
[0024] The fiber bundle 9 which consists of an ingredient which has the translucency of glass etc. and consists of many optical fibers lays a substrate 8 underground, and according to the thin film process, it forms a conductor pattern 10 and the common electrode patterns 11, such as aluminum and copper, in the front face, and forms in it the insulating coat 12 which consists of silicon nitride etc. except a connection.
[0025] On this conductor pattern 10, the IC chip 15 which controls the light emitting device array chip 13 and this light emitting device array chip 13 is being connected by the solder bump 5, respectively, and it works as one terminal for making light emit. In addition, the light-emitting part 2 of the light emitting device array chip 13 is a fiber bundle 9 and intermediary **** [as] which counters.
[0026] In the print head of the above-mentioned configuration, like drawing 5 , the solder bump 5 is formed in the end of the light emitting device array chip 13, and the projection 6 for inclination prevention is formed in the other end at coincidence.
[0027] Next, flux 18 is applied with a replica method etc. in a bonder on a conductor pattern 10, on it, the solder bump 5 is contacted and the light emitting device array chip 13 and the IC chip 15 are carried. Temporary adhesion of the light emitting device array chip 13 and the IC chip 15 is carried out by flux 18. Under the present circumstances, it sets without applying flux 18 to the insulating coat 12 which is the pasting up point of projection 6. Like drawing 6 R> 6, by letting a reflow process pass, the solder bump 5 fuses and it connects with a conductor pattern 10 in this condition. Projection 6 fuses to coincidence and the insulating coat 12 adheres at it.
[0028] Next, the transparence resin 20 which consists of ingredients, such as an epoxy resin, is filled up into the opening X between a substrate 8, the light emitting device array chip 13, and the IC chip 15 with a dispenser etc. after washing flux 18 in an acetone, IPA, etc. Under the present circumstances, transparence resin 20 is poured in from the projection 6 side for inclination prevention of the light emitting device array chip 13.
[0029] Since flux is not applied to a projection 6 side at this time, there is no residue 19 of flux and it can prevent that flux mixes in transparence resin 20.
[0030] in addition — the solder bump's 5 perimeter — the residue 19 of flux — ********** — although there are things, since transparence resin 20 is poured in from the reverse side with the solder bump 5, the residue 19 of flux does not flow in the location which interrupts the optical exposure of the light emitting device array chip 13
[0031] Then, it connects with the common electrode pattern 11 by applying to the common signal electrode 14 on the rear face of a light emitting device array chip conductive resin 21, such as an epoxy resin which mixed silver powder, by the dispenser, mask printing, etc.
[0032] In the case of 300DPI, the light emitting device array chip 13 is arranged on [40] a straight line, and the light-emitting part 2 of the light emitting device array chip 13 is put side by side on a total of 2560-piece straight line by the above actuation.
[0033] In addition, although this example explained the case of a print head, this invention is not restricted to it and can be used for all optical equipments carrying a light emitting device array chip or a light-receiving chip, such as a light emitting device indicating equipment.
[0034]
[Effect of the Invention] While forming a solder bump in the end of a light emitting device array chip according to this invention claims 1 and 2 Since the projection for inclination prevention is prepared in the other end, if it sets without applying flux to the projection [at the time of surface mounting] side by the light emitting device array chip Then, in a reflow and the process to wash, since intermediary detergency with the sufficient flow of a penetrant remover improves and a solder bump is in both sides like before, it can prevent flux residue remaining in a central light-emitting part, and becoming the hindrance of transparency of light.
[0035] Moreover, when it can prevent that the flux residue which adhered to the perimeter of a solder bump like before mixes in transparence resin, and becomes the hindrance of transparency of light by pouring in transparence resin from the projection side for inclination prevention which is not applied to flux, it has the ******** effectiveness when.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the sectional view of the optical equipment of this invention 1 example.
[Drawing 2] Similarly drawing 2 is the top view.
[Drawing 3] Similarly drawing 3 is the front view of a light emitting device array chip.
[Drawing 4] Similarly drawing 4 is the sectional view.
[Drawing 5] Drawing 5 is the sectional view showing the condition in front of the reflow of optical equipment similarly.
[Drawing 6] Drawing 6 is the sectional view showing the condition after the reflow and washing similarly.
[Drawing 7] Drawing 7 is the sectional view of conventional optical equipment.
[Drawing 8] Similarly drawing 8 is the top view.
[Drawing 9] Similarly drawing 9 is the front view of a light emitting device array chip.
[Drawing 10] Similarly drawing 10 is the sectional view.
[Drawing 11] Drawing 11 is the sectional view showing the condition in front of the reflow of optical equipment similarly.
[Drawing 12] Drawing 12 is the sectional view showing the condition after the reflow and washing similarly.
[Description of Notations]
4 Electrode for Supply
5 Solder Bump
6 Projection for Inclination Prevention
8 Substrate
10 Conductor Pattern
13 Light Emitting Device Array Chip
16 Conductor Pattern
20 Transparence Resin
X Opening

[Translation done.]